

Upload Assignment: Assignment 3.2

This assignment is intended to construct a Support vector machine using standard software. You can use Matlab or Python to complete this assignment.

The link to download the software is here: [SVM-LIB](#). You will need to download, expand and install the software in a folder. If you use Matlab, you will need to add the corresponding folder to the path. If you use Python, you will find the corresponding libraries in the folder.

For Windows users, find the subdirectory "Windows" with precompiled files, that can be called by Matlab. If they do not work with your Windows version, go to the subdirectory "Matlab", and there you will find c files that you will need to compile from Matlab. Just type "make" from matlab. Then use the compiled executable files.

Please find instructions on how to use the functions "svmtrain" and "svmpredict" in the assignment file above and the videos.

The Python version of the functions for data generation is

```
import numpy as np
```

```
import numpy.matlib as matlib
```

```
def data(N,sigma):
```

```
    w=np.ones(10)/np.sqrt(10)
```

```
    w1=[1., 1., 1., 1., 1., -1., -1., -1., -1., -1.]/np.sqrt(10)
```

```
    w2=[-1., -1., 0, 1., 1., -1., -1., 0, -1., -1.]/np.sqrt(8)
```

```
x=np.zeros((4,10))

x[1,:]=x[0,:]+sigma*w1

x[2,:]=x[0,:]+sigma*w2

x[3,:]=x[2,:]+sigma*w1

X1=x+sigma*matlib repmat(w,4,1)/2

X2=x-sigma*matlib repmat(w,4,1)/2

X1=matlib repmat(X1,2*N,1)

X2=matlib repmat(X2,2*N,1)

X=np.concatenate((X1, X2), axis=0)

Y=np.concatenate((np.ones(4*2*N), -np.ones(4*2*N)),axis=0)

Z=np.random.permutation(16*N)

Z=Z[:N]

X=X[Z,:]

X=X+0.2*sigma*np.random.randn(N,10)

Y=Y[Z]

return X,Y
```

The function is simply called as: $X,Y=data(100,1)$

The Matlab version is called as $[X,Y]=data(100,1)$:

```
function [X,Y]=data(N,sigma)

w=ones(1,10)/sqrt(10);

w1=w.*[ 1  1  1  1  1 -1 -1 -1 -1 -1];

w2=w.*[-1 -1  0  1  1 -1 -1  0  1  1];

w2=w2/norm(w2);

x(1,:)=zeros(1,10);

x(2,:)=x(1,:)+sigma*w1;

x(3,:)=x(1,:)+sigma*w2;

x(4,:)=x(3,:)+sigma*w1;

X1=x+sigma*repmat(w,4,1)/2;

X2=x-sigma*repmat(w,4,1)/2;

X1=repmat(X1,2*N,1);

X2=repmat(X2,2*N,1);

X=[X1;X2];

Y=[ones(4*2*N,1);-ones(4*2*N,1)];

Z=randperm(8*2*N);

Z=Z(1:N);

X=X(Z,:)+0.2*sigma*randn(size(X(Z,:)));
```

$$Y=Y(Z);$$